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COGNITIVE COMPLEXITY AND TRANSITIVITY OF PREFERENCE

by

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF SCIENCE

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EDMONTON, ALBERTA

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FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled "Cognitive Complexity and Transitivity of Preference" submitted by Lawrence Frank Pete in partial fulfillment of the requirements for the degree of Master of Science.

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Abstract

The relationship between cognitive complexity of Ss and transitivity of preference in two selection tasks of differing complexity was investigated. Twenty-eight cognitively complex and 28 cognitively simple individuals provided response sets for both selection tasks. In the simpler color selection problem, preference was determined essentially on an internal basis. In the more complex college selection problem, preference was determined on a partly subjective and partly objective basis arising from the imposition of external criteria as guidelines for choice. Also the amount of information processed per unit time was considerably higher in the college problem. Transitivity was assessed using the coefficient of consistency measure for complete response sets. An attempt was made to evaluate the tendency of complex verses simple persons to incorporate adaptively external logical structure for furthering transitivity of cognitive function.

Significant findings for the study were:

1. Cognitively complex individuals exhibited more transitive preference sets compared to cognitively simple individuals in the simpler color selection problem.

2. Transitivity of preference decreased for both cognitively simple and complex individuals as task complexity increased.

3. Difference in transitivity of preference between complex and simple individuals is dependent on the environmental complexity of the choice situation.

4. Compared to cognitively simple individuals, complex persons are more proficient in utilizing existing external logical structure for enhancing transitivity of preferences and less disrupted by decreased availability of external logical structure in some situations.

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Table of Contents

	Page
Abstract	iv
Acknowledgements	vi
Table of Contents	vii
List of Tables	viii
List of Figures	ix
Introduction	1
Hypotheses	12
Method	18
Apparatus and Materials	18
Subjects and Procedure	26
Results	33
Discussion	46
Summary	52
References	54
Appendix	58
Individual Topical Inventory	58
Scoring Norms	63

List of Tables

Table		Page
1.	Well and poorly named color stimuli	21
2.	Profiles for college selction problem	25
3.	Ordered sequence of stimulus pairs	28
4.	Random sequence of stimulus pairs.	30
5.	Analysis of variance for cognitive complexity and problem complexity	34
6.	Consistency coefficients for complex x simple Ss in color and college selection problems	35
7.	Cognitive complexity x problem complexity	38
8.	Analysis of variance for color selection problem	39.
9.	Consistency coefficients for complex and simple Ss: color selection problem	40.
10.	T-test for minor hypotheses	41.
11.	Analysis of variance for college selection problem	41.
12.	Consistency coefficients for complex and simple Ss: college selection problem	43.
13.	Analysis of variance for performance decrement	44.

List of Figures

Figure		Page
1.	General relationship between environmental and behavioral complexity.	3
2.	Behavioral complexity as a function of environmental complexity and personality structure	4
3.	Average hue selection by Chapanis's (1965) Ss. Hue specification of well named and unnamed colors.	19
4.	Cognitive complexity x problem complexity	37
5.	Graphical representation of cognitive complexity x selection task complexity.	48

Introduction

A theoretical model of human information processing has been formulated by Harvey, Hunt, and Schroder (1961). It describes "how" individuals employ conceptual structures like attitudes, strategies, concepts and norms, in organizing information. As presented in the model, the conceptualization of information processing involves perception and consequent organization of information. The perceptual aspect, differentiation, corresponds to a dimensional analysis in which stimuli are assigned meanings on unique dimensions. The organizational aspect, integration, refers to the number and interrelatedness of schema employed in processing the perceptually differentiated material. Alternately stated, integration represents the complexity of the schemata that determine the organization of several dimensions involved in a complex cognitive structure.

In the model, level of differentiation and integration, or level of cognitive complexity is related to ability to process environmental complexity. It is postulated that complex (abstract) persons, high in levels of differentiation and integration can better cope with environmental complexity than simple (concrete) persons, low in levels of differentiation and integration. The class of individuals referred to as simple requires a highly ordered existence in which uncertainty is kept at a minimum. Simple persons interpret events unequivocally, because novel, complex, insoluble situations are threatening to them.

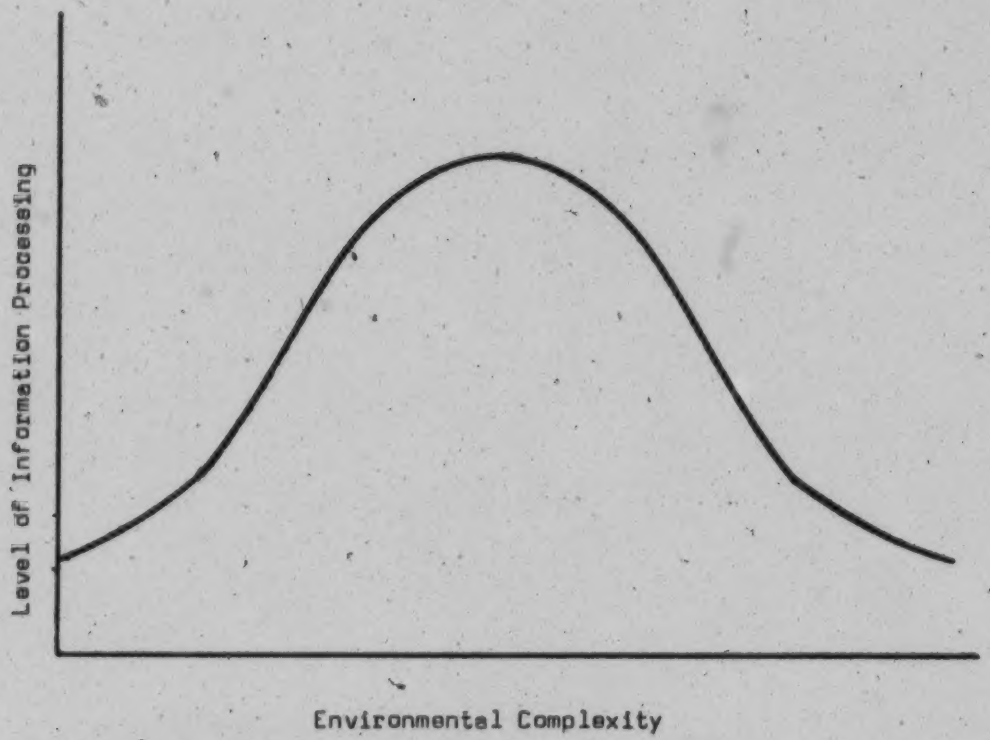
They force experience into preordained categories showing few alternatives, limited perspectives, and inflexibility. Complex persons fall at the opposite end of the hypothesized complexity continuum. They show greater facility for dealing appropriately with novel, complex, and insoluble situations and maintain a highly differentiated perspective and interpretation of experience.

Refinements and extensions in the model of Harvey, Hunt, and Schroder were presented by Schroder, Driver, and Streufert (1967). They formulated an inverted U-curve hypothesis relating level of information processing and environmental complexity. Their premise is that disregarding individual differences, information processing by a randomly selected sample of individuals reaches a maximum level of structural complexity at some optimal level of environmental complexity. A graphical representation of the hypothesis is given in Figure 1.

Incorporating organismic variables as mediators of stimulus material, lead Schroder, Driver, and Struefert to derive a second hypothesis, given their main model. Their supposition was that information processing may be expressed by a family of inverted U-curves which takes account of individual differences. (These curves are illustrated in figure 2.) According to this formulation, integratively complex Ss will show maximal level of information processing at higher levels of environmental complexity than will integratively simple Ss. This is supported in a study Schroder et. al. (1967) in which they found that the highest level of information processing occured at moderate levels of

Figure 1

General relationship between environmental and behavioral complexity



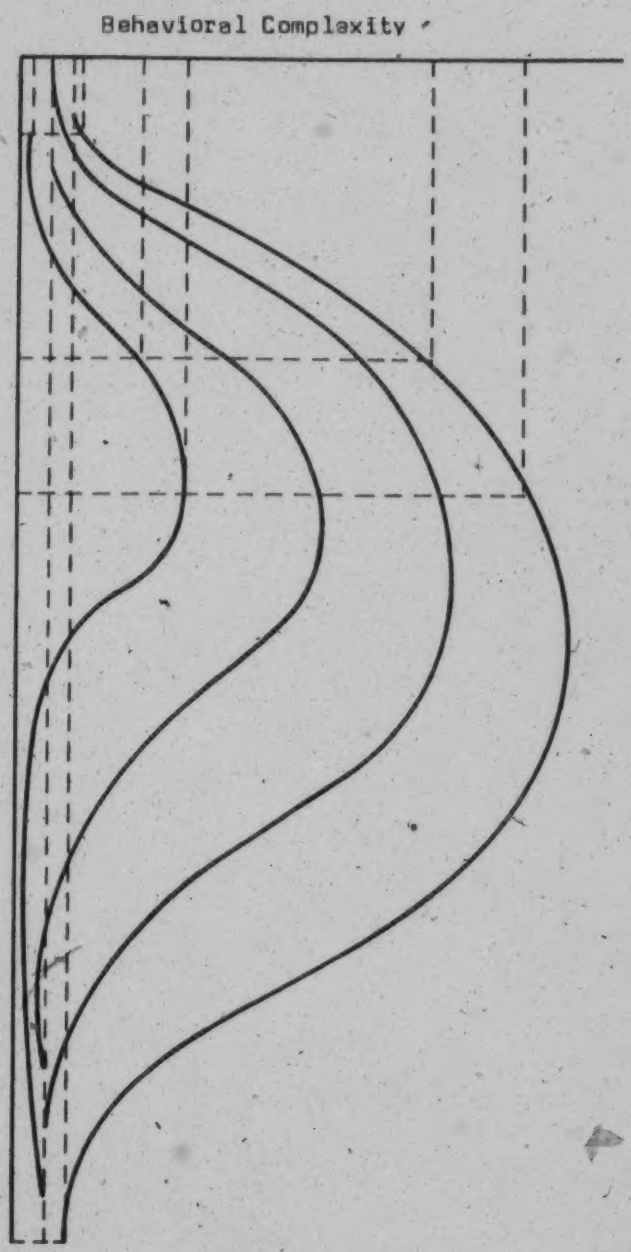


Figure 2 Behavioral Complexity as a Function of Environmental Complexity and Personality Structure

environmental complexity. In addition, they found that cognitively complex persons performed better than cognitively simple persons at all levels of environmental complexity especially at intermediate levels.

There is little consensus on the role of cognitive complexity in cognition. Vannoy (1965) identified three differing positions regarding the generality of the cognitive complexity construct in cognitive functioning. These conflicting positions define cognitive complexity as:

1) a relatively enduring disposition to view the person-objects in ones social environment in a complex differentiated manner (Harvey, Hunt, and Schroder, 1961; Schroder, Driver, and Struefert, 1967).

2) an enduring extensive trait, pervading all realms of cognitive function (Bieri and Blacker, 1956; Allard and Carlson, 1963), and

3) a somewhat transitory predisposition applying to a particular cognitive domain made salient by situational demands (Gardner and Schoen, 1963; Scott, 1963; Zajonc, 1960).

Position (1) best represents the view of Harvey et. al., (1967). For these authors, integrative complexity is seen not as a fixed general ability, but a potential to engage a complex interrelated set of conceptual rules in processing information in a given cognitive area, particularly the interpersonal area. According to Schroder et. al., level of information processing can vary across content areas so that a person can be complex in one area and conceptually quite simple in another.

Additionally, it should be noted that Harvey et. al., (1961) and Schroder, et. al., (1967) stress the integrative aspect of complexity. While differentiation is a necessary but not sufficient condition for complexity, integration is the most relevant and essential aspect of complex functioning for Harvey et. al., and Schroder et. al..

Generality of cognitive complexity was a major issue in this study. An investigation was made of the possibility that integrative complexity may be functioning in organization of information in domains other than the social or interpersonal. The attempt to demonstrate implication of cognitive complexity in information processing in non-social domains is centered on the study of cognitive complexity in relation to consistency and preference, two areas centrally implicated in human behavior.

Consistency is an essential component of rationality. Transitivity is one of the relational laws of formal consistency. It is one of the most compelling principles of sound reasoning (Tversky, 1969). Moreover, rationality, and thus, consistency and transitivity, are highly valued personal attributes, and consequently important to the study of psychology and to the individual. Tversky (1969) especially has argued that transitivity is of central importance in psychology. He has stated that it is the corner stone of normative and descriptive decision theories and that it underlies measurement models of sensation.

Preference is an essential component of behavior. Perls (1969) expresses a strong view about the pervasiveness of preference in

human affairs. He maintains that man does not make decisions outside the context of preference. From his systematic position, preference is regarded to be isomorphic with selection of social needs and with means whereby organismic end-gains are achieved. For example, in his clinical interpretations, all perversions and pathologies are defined as variations in selected (exhibited preferences) means whereby end-gain is sought.

The relations of consistency and preferential structure to level of integrative complexity is the subject of this thesis. At the level of the individual, it can be asked: what is the reaction of individuals to revealed inconsistency in their thought processes or attitude-value structures? Will revealed inconsistency motivate individuals to change significant aspects of their value system? By self-declaration, assumed rationality is probably universal. The vast majority of people are likely to accept and tenaciously hold an unquestioned premise: "I am a rational, logically consistent person."

Some theorists of social change presume the basic motivating factor in change is a rational principle (Festinger, 1957; Rokeach, 1971). In this rational principle, it is asserted that if an individual becomes cognizant of dissonance among cognitive elements, he will act to eliminate that dissonance. Predictions focus on modes of dissonance induction and reduction.

Empirical evidence supporting the premise that cognitive self-consistency has motivating value is provided by Tversky (1969) and MacCrimmon (1965). Tversky reported that University undergraduates

viewed violations of transitivity as errors of judgement or reasoning. They were most reluctant to admit to the existence of consistent intransitivity in their own behavior and felt people were, and should be, transitive. Even in the face of empirical evidence obtained in the experimental situation (in which they served as Ss) they found it very hard to believe they had exhibited consistent intransitivity in their preference sets. MacCrimmon (1965) in a study of decision making behavior of business executives concluded that people faced with their own intransitivities tend to adjust their choices so as to accommodate the transitivity principle.

Also, evidence obtained in impression formation and trait inference contexts relates consistency to level of complexity and tends to validate the need for consistency shown by simple individuals. Bearing most directly on the current study, was the finding by Ware and Harvey (1967), that simple Ss exhibited greater need for cognitive consistency and were more certain of their impressions than complex Ss. Similarily, Leventhal and Singer (1964) and Mayo and Crockett (1964) found that presentation of new, inconsistent information concerning a target person caused simple Ss to change their opinions more than complex Ss. In studying trait inference, Felipe (1970) indicated the involvement of two consistency achieving mechanisms, one descriptive, the other evaluative. Furthermore, both Felipe (1970) and Peabody (1970) contended that traits which are consistent, both descriptively and evaluatively, have a greater liklihood of being inferred than traits which are only descriptively or evaluatively consistent. Thus, achievement of consistency seems important for

some Ss in several contexts.

Finally, in a somewhat similar situation, Rokeach (1971) obtained data supporting the tendency for reluctant acceptance (or for rejection) of self-generated inconsistency. He exposed individuals to information designed to make them aware of inconsistencies within their own value-attitude systems, inconsistencies of which they were previously unaware. Awareness of such inconsistency Rokeach claimed, produced long range changes in core values and personal behavior in a significant portion of the experimental group. In addition, Rokeach could ascertain quickly and could predict readily the nature and direction of these changes.

However, Rokeach found that only a certain, but significant portion of individuals showed the motivating effects of dissonance he reported. Important questions thereby arise. One rather provocative question is: is it possible to preselect individuals for degree of susceptibility to such manipulation? As a first attempt at an answer, one might investigate the possibility that individuals may be differentiated on the basis of their tendency to show inconsistency in some aspects of their cognitive behavior. Theoretically, different persons' susceptibilities to Rokeach's techniques should increase as their tendency to be inconsistent, increases. This, however, presumes a graded not a universal rejection of inconsistency on the part of Ss.

This possibility is borne out by Tversky's study. He preselected Ss for their tendency to be inconsistent on the specific task being employed. The possibility of selecting individuals on the basis of some criteria more general than that of response consistency in the

specific experimental task warrants consideration. To this end, it appears reasonable to attempt to relate predisposition for inconsistency to personality factors. Harvey, Hunt, and Schroder's (1961) cognitive theory of personality suggested consideration of the cognitive complexity variable may be appropriate.

Additional impetus for consideration of cognitive complexity came from Vannoy's study. Even though Harvey et. al. and Schroder et. al. did not relate integrative complexity to logical operations, note was taken from Vannoy's finding in this regard. Vannoy presented evidence which suggested that the facility of complex persons in dealing with mathematical concepts may be associated with the tendency to utilize multiple constructs in differentiating the social environment. Similarly, although Harvey et. al. tried to eliminate verbal fluency (length of sentence completion) as a criterion for integrative complexity, attention was given to Vannoy's finding that complex persons are verbally brighter than simple persons. While verbal intelligence did not load with Schroder's Completion Test in Vannoy's study (1965), Schroder et. al. (1967) reported correlations between scores on general intelligence tests and integrative complexity ranging from 0.15 to 0.45. Since it was attempted in the present study to investigate the possibility of implicating cognitive complexity in organization of information in a cognitive-perceptual, rather than a social domain, Vannoy's evidence was accepted as relevant for formulation of hypotheses.

Extending Vannoy's finding regarding greater mathematical facility of complex Ss, it was argued that assuredly an individual capacity to

deal effectively with mathematical concepts is associated with his tendency to employ logically consistent operations in his thinking. Therefore, the first question is whether the attributes of complex Ss resulted in their tendency for logical consistency to be so generalized that it would manifest itself in capacity to deal consistently with constructs somewhat removed from mathematical concepts. More specifically, can cognitive complexity be implicated in generating hierarchical attitude-value structures or sets of preferences?

Our second question was whether preference research would support the existence of an association between consistency (transitivity in preference responding) and cognitive complexity. More specifically, would Ss of differing cognitive level as assessed with the Individual-Topical Inventory, an instrument designed to measure level of complexity through analysis of the individual's structuring of the interpersonal environment, show different levels of preference consistency? Experimental demonstration of the expected result would support the view that the consistency with which a set of preferences is formulated depends upon the level of cognitive complexity of the S, and would thus extend the construct validity of cognitive complexity beyond the social-interpersonal domain.

The relationship between cognitive style, complexity of stimulus material and consistency of response in a preference situation was investigated as follows.

Two types of preference situations were utilized. In the simpler one, choice is made between stimuli called unitary alternatives.

These include alternatives such as color, sounds, and shapes. Unitary alternatives are usually evaluated as wholes (Tversky, 1972) and are referred to as unanalyzable (Shepard, 1964). Choice of color etc. is called elementary and is viewed as not subdivided into simpler decisions (Luce, 1959). In the present study the simple stimuli for the unitary alternative preference situation are colors.

Complex choice requires subjective weighting of composite alternatives such as gambles or job applicants. Alternatives are considered to be evaluated according to their attributes or components. The individual must adopt some strategy for evaluating the importance of various attributes of each alternative, and the significance of various combinations of the attributes, for appropriate choice. Apropos to this, Shepard (1964) and Torgerson (1965) have maintained that judgements of unitary and composite stimuli are governed by different rules. Typically choice experiments in psychophysics involve imperfect discrimination with unitary stimuli, while preference experiments usually are concerned with conflict among composite alternatives (Tversky, 1972). In the present study, the complex stimuli, for the composite alternative preference situation, are information profiles of university applicants.

Hypotheses

Two distinct sets of hypotheses, of differing importance were formulated. The major set consists of two general hypotheses. Verification of these two hypotheses is desirable to establish the existence of the predicted relationship between cognitive complexity

and consistency. Confirmation is the major objective of the present study.

The major set of hypotheses is comprised of predictions regarding differences in responses of complex and simple Ss and predictions arising from the differences between complexity (difficulty) in the unitary alternative color selection problem and the composite alternative college selection problem. Results for this set of hypotheses show the effects of varying problem difficulty.

Predictions about differences between the complexity levels of problems are based on the following considerations. Comparison of the color selection problem and the college selection problem suggests that the college problem is likely the more complex of the two. This judgement reflects the fact that the college selection tasks requires making comparisons among six numbers, or between two sets of three numbers. Complexity is further increased because decisions must be executed in accordance with an externally imposed criterion which will be described later. Additional complexity arises in the college selection task, because S is encouraged to believe that his preferential decisions will have consequences for others. Social responsibility may be present in this problem while absent in the color preference situation. In the color selection problem S chooses between two colors on the straightforward basis of subjective preference. He simply selects from the two colors, the one he likes the more.

Existing theoretical understanding of cognitive complexity and consistency do not define the mathematical (functional) form of any relationship to be expected between these variables. No prediction

is offered, therefore. The rationale for this is as follows. It is not theoretically necessary that any difference in consistency of functioning postulated between cognitively simple and cognitively complex Ss is parallel across complexity levels. The theoretical difference between cognitively complex and cognitively simple Ss only presupposes different responsiveness to most situations of differing complexity. That is, consistency of functioning in the complex task and in the simple task should not be the same under most conditions for the two levels of cognitive complexity if cognitive complexity means possessing qualitatively different abilities for processing bodies of data. However, differences can be expected under conditions which exceed the integrative capacity of both groups of subjects. Thus in highly complex problems, a given cognitive style may cease to be advantageous. Evidence shows that individuals regress from higher to lower levels of cognitive complexity under stress. We may not exclude that level of cognitive functioning by complex Ss may drop under the pressure of complexity to a level functionally equivalent to that of simple Ss performing in the same conditions. Empirical, as well as theoretical considerations preclude the assumption of a parallel relationship between consistency and cognitive complexity for cognitively simple and cognitively complex Ss across levels of problem complexity.

The major hypotheses of the study are that:

1. Cognitively complex Ss obtain higher consistency scores (coefficients of consistency) than cognitively simple Ss.
2. Coefficients of consistency decrease for both cognitively simple

Ss and cognitively complex Ss as stimulus complexity increases. Interaction probably occurs between cognitive level (1) and problem complexity (2) although the specific form the interaction will take is difficult to predict, from our present state of knowledge.

Secondary predictions evolve from consideration of codability of color and degree of set structure inherent in presentation of stimulus pairs. Presumably, they are based on the following assumptions.

Given that color processing is effected by Ss naming capability, which itself is partially innate, codability becomes implicated in color discrimination. And given that high and low codability colors differ with respect to language content (as described later) it is proposed that simple Ss will find low codability or poorly named colors more complex to process in a cognitive-perceptual task than complex Ss. The lesser verbal talent, decreased facility for discrimination, and lower tolerance for ambiguity of simple S should handicap his functioning in the task at hand. Simple Ss should have greater difficulty in providing an anchoring-name or label for the poorly named colors and should force such colors into broader categories by making grosser discriminations, and should perhaps find more confusion in the resulting ambiguity-significantly more so than the complex Ss. Thus more specifically, it is hypothesized that simple Ss will show less transitivity (greater inconsistency of preference) in dealing with poorly named colors.

In this study it was hypothesized that characteristics ascribed to cognitively complex Ss should make them indifferent to the presence or absence of structure in order of presentation of stimulus pairs

relative to the simple Ss. Their assumed partiality to order should alert and prepare the cognitively simple Ss to recognize order inherent in procedures for presentation of stimulus pairs, and to utilize this order in organizing their decisions. Having once ordered the colors in a given subset of n elements, the cognitively simple S is likely to maintain the established order as much as possible in the next subset of (n+1) elements. The inflexibility of the cognitively simple S would also contribute to the tendency to maintain consistent order throughout recognized subsets. Disruptive interference from imposition of new elements for comparison is less in the orderly structured than randomly structured sets.

Consideration of the structure variable does not lead to any well supported predictions in the college selection problem. Set structure might facilitate consistency as described above, by aiding memory and organization within an appropriate strategy, or alternately, it might promote response inconsistency through encouraging consistent use of an inappropriate decision strategy throughout an entire subset of comparisons. The greater inflexibility in approach for cognitively simple Ss would foster rigid adherence to a once chosen decision strategy. An example of an inappropriate decision strategy, one which is inherently productive of intransitivity is given on page 28. Three hypotheses from the secondary set of hypotheses deal with set structure.

The secondary hypotheses of the study are:

1. In low codability color sets, mean consistency scores are higher for cognitively complex than for cognitively simple Ss.
2. In randomly ordered sets, consistency scores are higher for

cognitively complex than for cognitively simple Ss.

3. In low codability randomly ordered sets, consistency scores are higher for cognitively complex than for cognitively simple Ss.

4. Cognitively simple Ss obtain higher consistency scores in ordered sets than in randomly structured sets.

Method

Apparatus and Materials

Two choice situations were studied. Rationale and description of the color selection problem and the college selection problem follows.

Color appears to be relevant to people in many ways and questions of preference for color stimuli are common. Nonetheless, choice between colors is not embedded in a complete logical substructure as is choice between gambles or judgemental ratings of stimuli. Colors provide stimulus material for the non-instrumental choice situation in which no external criteria are given for evaluation of a pair of stimuli. S chooses which item pleases him more. Therefore, consistency of response seems to be determined on an internal rather than an external basis.

Colors were chosen on the basis of Chapanis' (1965) and Bradbury's (1970) work. Chapanis gives data on Munsell color chips which have reliable color names. He reports a consensually validated mapping of color names to specific wavelength segments of the hue circles as shown in Figure 3. Inspection of Figure 3 reveals those areas of the hue circle which are best represented by English color names. It should be noted that color surfaces from the various areas represented are equally discriminable using matching techniques (Bradbury, 1970). Color surfaces with consensually validated names are referred to as well named colors and have high codability. These well named colors are roughly equivalent to focal colors described

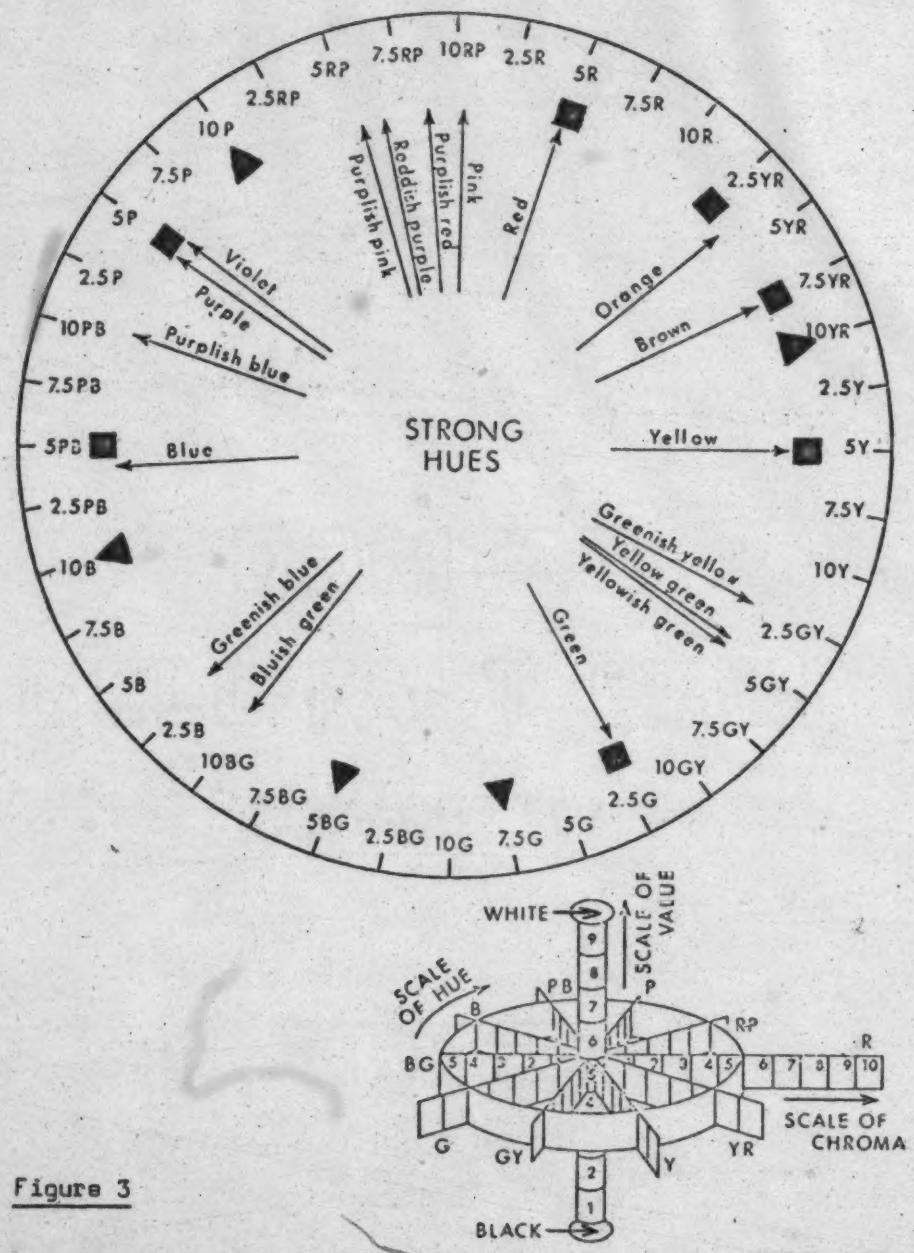


Figure 3

Average hue selections (arrows) by Chapanis's (1965) Ss. Notations follow the Munsell System. Squares and triangles indicate the hue specifications of color stimuli selected as well named and unnamed colors respectively. Munsell three dimensional representation of color space appears below the circle.

by Berlin and Kay (1969).

Following the procedure of Bradbury (1970), six samples were selected from the hue circle as representing well named colors (Chapanis, 1965) while simultaneously providing a complete as possible sampling of the circle. Six other hues without clear English names but with equivalent differences in discriminability (Chapanis, 1965) were chosen so as to have a comparable distribution on the hue circle. In order to arrive at two equivalent sets, the spacing of the well named hues was rotated on the hue circle so as to provide comparably distanced hue locations falling in poorly named areas. Locations for both well named and poorly named colors used in this study are also indicated in Figure 3. Table I gives the experimental code, Munsell specification, color name (for well named colors) and the number of hue spaces between each color, for the colors used.

To summarize, it has been empirically demonstrated that while the set of well named and poorly named colors are discriminably equivalent, they are not codifiably equivalent. The well named colors can be readily assigned consensually validated English labels. The hypotheses are applied to these color sets, setting out the implications of these differences in the context of consistency of response in cognitively simple and cognitively complex Ss.

A considerable increase in the understanding of color names has occurred in the last few years. Researchers used to argue support for the dependence of color naming on cultural factors (Whorf, 1950; Brown and Lenneberg, 1954; Lenneberg, 1961; Langer and Rosenberg, 1966; Bradbury, 1970). However, on experimental grounds, Berlin and Kay (1969)

Table 1

Munsell specifications of well and poorly named color stimuli for study of cognitive complexity and transitivity of color preference. Items in each set are listed A-F as they appear in clock-wise progression around the hue circle:

Well Named Colors

Code	Munsell Specification	Color Name	No. of hue spaces between each
A	5.0 R 4/14	Red	3
B	2.5 YR 6/16	Orange	5
C	5.0 Y 8.5/14	Yellow	7
D	2.5 G 5/12	Green	13
E	5.0 PB 5/12	Blue	4
F	5.0 P 3.9/10.9	Purple	

Poorly Named Colors

Code	Munsell Specification	No. of hue spaces between each
A	7.5 G 6/10	3
B	5.0 BG 7/8	6
C	10 B 6/10	8
D	10 P 5/12	12
E	10 YR 8/14	4
F	10 Y 8.5/12	

and Heider, (1972) have rejected the linguistic relativity doctrine that each language segments the three dimensional color space arbitrarily. Salient areas of the color continuum, called focal colors, have been identified. These colors are universally the most linguistically codable and most easily remembered.

Berlin and Kay (1969) also maintain that these "focal" colors are encoded in a partially fixed order across all languages as they evolve. Focal colors are regarded as physiologically "primary" hue, in the sense defined by De Valois and Jacobs (1968). The attributes of focal colors are viewed as deriving from the physiology of primate color vision.

Munsell stimuli were glossy-finished 6"x10" type color sheets and mounted on cardboard to facilitate handling. A stand 5' 4" along the horizontal axis and 3' along the vertical axis was used to present the color stimuli at eye level through an opening slightly less than 6"x10". A color-card carrying device on the reverse side of the stand, consisted of a piece of plywood supported by upper and lower sliding tracks. This permitted the mounting and successive presentation of pairs of colors. The screen and the piece of sliding plywood were painted a flat grey approximating the recommended color suggested by the Munsell Color Company for background in presentation of "bright" colors.

All testing (color vision and experimental presentation of colors) was carried out with illumination provided by ordinary overhead florescent light source installed in the ceiling of the laboratory.

"Complex" stimuli, as used in composite alternatives preference situation, must be described in a different context. Consider,

for example, a situation in which three alternatives x, y, and z vary along two dimensions I and II and where their values on these dimensions are given by a matrix. The alternatives represented in this case are job applicants varying in intelligence (I) and experience (II). Thus the entries in the "payoff" matrix below are the candidate's scores on dimensions I and II (intelligence and experience) for persons x, y, and z.

ALTERNATIVES	DIMENSIONS	
	I	II
X	2e	6e
Y	3e	4e
Z	4e	2e

Further, assume that the subject who is to make the selection operates on the following selection rule when making a choice between items of each pair of alternatives. The rule is (1) when difference between the alternatives on Dimension (I) is greater than "e", choose the alternative with the higher value on Dimension (I), (2) when difference on Dimension (I) is less than or equal to "e" choose the alternative that has the higher value on Dimension (II). In the example below, with e=1, differences between x and y and between y and z on the first dimension are not greater than e(1), z is chosen over x yielding an intransitive chain of preferences. Thus a seemingly reasonable decision rule yields intransitive preferences.

The present study will employ the college selection problem used

by Tversky (1969). Ss will be presented with pairs of hypothetical applicants and asked to choose the one they would accept. Each applicant will be described by a profile giving his percentile ranks on three evaluative dimensions labelled I, E, and S. Dimension I reveals intellectual ability, E emotional stability, and S social facility. The profiles were constructed to provide perfect negative correlations between the scores on the Dimensions, I and E, and I and S. The ten profiles used in the study appear in Table 2.

Tversky (1969) interprets the task as a complex decision making process. An S faced with multi-dimensional alternatives finds it extremely difficult to utilize properly all available information. Tversky contends that Ss employ various approximation methods to enable themselves to process the relevant information in making a decision, unlike the case for the color problem. In the college selection problem, transitivity of choice is studied as it evolves out of response made on the basis of complex aspects of a multi-dimensional stimulus context operation in relation to the response strategies.

The assumption in the present study is that complex Ss will use more of the available information more appropriately, and their approximations should be more transitive (consistent) than those of simple Ss.

Even in the non-multidimensional situation, the case is not essentially simple. The stimuli in their comparisons produce relational stimulus variables which are not attributable to the items separately. Just as in the multi-dimensional case, the response

Table 2

The ten profiles used in the college study problem.

I intellectual ability, E emotional stability, S social facility.

Entries under I, E, and S represent percentile scores obtained by hypothetical college applicants.

Applicants	Dimensions		
	I	E	S
1	63	96	95
2	66	90	85
3	69	84	75
4	72	78	65
5	75	72	55
6	78	66	45
7	81	60	35
8	84	54	25
9	87	48	15
10	90	42	5

itself exerts influence on the context which alters the relationship of the stimuli. Intransitivity is by definition, a contradiction of a relation established (implied) between items in the first two choices in a three choice sequence. It has been suggested (Bradbury, 1972) that emphasis on context effects to demonstrate intransitivity, as in Tversky (1969) and Coombs (1958), makes it clear that consistency is not so simple a matter as the rule of logical transitivity would require.

Structure of Stimulus Sets

Set structure was also manipulated to evaluate the sensitivity of any demonstrated differential tendency in consistency of response between complex and simple Ss. The two types of set structure are called "ordered" and "mixed". In ordered sets there was on obvious pattern present which determines the succession of stimulus pairs.

Subjects and Procedure

Tuckman's Individual-Topical Inventory, (ITI) was administered to groups of Ss enrolled in introductory psychology classes at the University of Alberta. The ITI is a forced-choice instrument in which S was asked to choose one of a pair of items that best represented his feelings or reactions to an interpersonal topic. The test consists of six hypothetical statements each having six pairs of responses. Each possible response represents an "ideal completion" that assumedly would be given by an S at one of the four levels of complexity as postulated by Harvey et. al. (1961). S was given four scores each representing his total number of responses for each of the four classifications. If a S scored 9th or 10th Decile in one system and 8th or lower in all others, he was classified in the highest system.

Also Ss who scored 8th Decile on one system and 6th or lower in all others were classified in the highest scoring system. (See Appendix I for a copy of the ITI and scoring norms).

Participation was voluntary and approximately a fifth of the Ss contacted declined the invitation to participate. In total 56 Ss volunteered. There were 28 cognitively complex Ss, 18 females and 10 males; and, 28 cognitively simple Ss, 13 females and 15 males. Ss were randomly assigned to experimental consitions within their designated complexity category. All were tested individually.

Procedure

To obtain exhaustive intercomparisons, Ss were successively presented all members of a set of stimulus items in all possible paired combinations. A full set of comparisons permits assessment of the degree to which any S was consistent (transitive) in his choices. Recorded responses are preferences between pairs of stimulus items.

All possible pairs of combination of six and ten stimulus items were presented. More specifically, for six stimuli, there are fifteen different pairs and for ten stimuli, forty-five pairs.

The following sequence of pairs (Table 3) was used in the ordered set conditions. Presentation in ordered subsets was expected to facilitate rational treatment of the preferences.

The full ordered set of all possible paired combinations of any ten stimuli is represented in the above sequence (six color stimuli require only the first fifteen pairs). Note the obvious and consistent pattern in the succession of pairs. The ordering principle is that the latest member of any subset of pairings (eg. D being paired with A,B, and C) is always placed secondly within the pair and each previous

Table 3

Ordered sequence of pairs forming all possible paired combination of six and ten stimuli.

1. AB	16. AG	31. CI
2. AC	17. BG	32. DI
3. BC	18. CG	33. EI
4. AD	19. DG	34. FI
5. BD	20. EG	35. GI
6. CD	21. FG	36. HI
7. AE	22. AH	37. AJ
8. BE	23. BH	38. BJ
9. CE	24. CH	39. CJ
10. DE	25. DH	40. DJ
11. AF	26. EH	41. EJ
12. BF	27. FH	42. FJ
13. CF	28. GH	43. GJ
14. DF	29. AI	44. HJ
15. EF	30. BI	45. IJ

member is paired with it in successive turns (eg. AD, then BD, then CD).

The sequences used in randomly ordered presentation are given in Table 4 for both sets of six and ten stimuli.

After being appropriately seated for color selection S was instructed as follows:

"This experiment deals with preferences. I am going to show you some colors through the window on this stand. The colors will always be presented in pairs, first one, then the next will be shown; and out of each pair, I want you to choose the one you prefer or the one that pleases you most. I want you to indicate your choice on the response sheets I have given you, the sheets of pairs of x's. The first set of paired x's under the heading 'color' has 15 pairs and the second set of paired x's under the heading 'college' has 45 pairs of x's and are to be used in the 'color' and 'college' tasks respectively. We well begin with the color task. If you prefer the first color of the first pair, you would circle the first x of the pair of x's. If for the second pair you prefer the second color, you would circle the second x of the pair of x's. Follow this procedure for all pairs of colors you are shown.

I will ask you to make a choice out of each pair even if you do not see too much difference between items. Do not return and change an answer once we have gone on and seen more pairs.

I want you to think of the colors you will be shown as the color in general rather than the color of some specific thing. I say this so that you will not think, for example, of one color you see as the color of a shirt or blouse and the next color as the color of a car or

Table 4

Randomly determined sequence of pairs forming all possible paired combinations of six and ten stimuli.

Set of 6	Set of 10		
1. CD	1. BC	16. DG	31. HJ
2. DE	2. DH	17. AD	32. BI
3. BF	3. CF	18. GI	33. DI
4. CF	4. DJ	19. AC	34. BG
5. BE	5. AH	20. BD	35. AF
6. EF	6. BE	21. IJ	36. EF
7. DF	7. FH	22. AI	37. BJ
8. AE	8. AJ	23. CJ	38. FJ
9. CE	9. BH	24. EJ	39. FI
10. AD	10. CH	25. AB	40. DF
11. BD	11. EH	26. FG	41. HI
12. BC	12. CG	27. BF	42. EI
13. AC	13. EG	28. CD	43. CI
14. AB	14. AG	29. GH	44. AE
15. AF	15. DE	30. CE	45. GJ

house. I want you to think of all the colors in the same general context."

Instructions for the color problem were adapted from Bradbury (1970).

Ss were then given a trial run with an extraneous pair of colors. After the trial run, it was pointed out to them that the colors would be shown for about five seconds, there would be about a 10 second interval between pairs, and that the number of the pair about to appear would be announced each time. At this point, final questions were permitted.

Immediately after Ss completed the color preference task, he was introduced to the college selection problem. The instructions adapted from Tversky (1969) were:

"The university selection committee is interested in learning student opinion concerning the type of applicants that should be admitted to the campus. As a committee member, you are asked to select which you would admit from each of several pairs of applicants. Each applicant will be described by a profile showing his percentile ranks on three dimensions of importance I, E, and S. I reflects intellectual ability, E reflects emotional stability, and S reflects social facility. The profiles were constructed by a selection committee on the basis of high school grades, intelligence and personality tests, letters of recommendation and a personal interview.

Naturally intellectual ability would be the most important factor in your decision but the other factors are of some value too. Also you should bear in mind that the scores are based on the committee rankings and thus are not perfectly reliable."

Ss were next told that responses should be recorded as in the

color selection problem and a trial run was given. After this, it was noted that each profile would be visible for about ten seconds and there would be a ten second interval between pairs of profiles. Questions were answered and the testing followed immediately.

Order of presentation of problems was randomized over Ss. In instances where the college selection problem preceded the color selection problem, appropriated directions on response recording were included in the instructions.

Design

The design for testing the major hypotheses was as follows:

A x B x C, three factorial, repeated measures on factor C with

2 levels of cognitive complexity, A_1 complex and A_2 simple,

2 levels of set structure, B_1 random and B_2 ordered,

2 levels of problem complexity, represented by

C_1 the color problem and

C_2 the more difficult college selection problem.

Results

A measure of the extent of transitivity in each full ordered set of comparisons to which the individual Ss were exposed was scored on the basis of the coefficient of consistency (Kendall and Smith, 1940; Kendall, 1962; Harary, Norman and Cartwright, 1956). This coefficient is obtained by deriving the fraction of obtained inconsistencies over the maximum number of inconsistencies possible and subtracting this fraction from the number one. The coefficient ranges over values from one representing a completely transitive response set and zero representing maximum inconsistency. The method for measuring consistency is based on the realization that in any given complete response set, an individual may be completely consistent or may exhibit a fixed maximum number of inconsistencies.

Major Hypotheses

Analysis of variance of Ss' preference sets yields significant main effects ($p<0.01$) for cognitive level and problem complexity. Complex Ss obtain higher mean scores than simple Ss and consistency coefficients are significantly lower ($p<0.001$) on the multi-dimensional college selection problem than on the color problem.

A significant interaction ($p<0.020$) occurs for cognitive level and problem complexity. Thus, while complex Ss obtained significantly higher consistency scores on the color selection problem, they obtained essentially equivalent consistency scores in the college selection problem. Table 5 gives a summary of the analysis of variance.

The mean consistency scores x 100, obtained by cognitively complex and cognitively simple Ss are entered in Table 6. In the more simple

Table 5

Summary of analysis of variance for cognitive complexity and problem complexity. Measures are based on consistency scores for complete paired comparison preference sets.

A cognitive complexity, B set structure, C problem complexity

Source of Variation	DF	MS	F	P
Between Ss				
A:	1	3421.00	6.57	<.01
B:	1	319.56	1.57	n.s.
AxB:	1	158.18	0.30	n.s.
Error:	52	520.59		
Within Ss				
C:	1	5728.37	16.20	<0.0001
AxC:	1	2014.75	5.70	<0.02
BxC:	1	0.37	0.00	n.s.
AxBxC:	1	10.93	0.03	n.s.
Error:	52	353.51		

Table 6

Mean consistency coefficients x 100 for complex and simple Ss in the color and college selection problems

	Color Selection	College Selection
COMPLEX Random	85.86	62.43
COMPLEX Ordered	93.00	70.86
SIMPLE Random	71.71	60.28
SIMPLE Ordered	68.07	62.85

color selection problem, cognitively complex Ss achieved higher mean scores than cognitively simple Ss in both conditions of set structure, random and ordered. In the more complex college selection problem, cognitively complex Ss appear to achieve higher mean consistency coefficients only in the ordered set presentation but the difference does not reach regular levels of reliability. Table 7 contains data for the cognitive complexity x problem complexity interaction. A graphical representation of the interaction appears in Figure 4.

The major hypotheses are well supported by all results.

Minor Hypotheses

The design for testing the minor hypotheses had nested the color problem within the overall 2 x 2 x 2 repeated measures design, as a complete 2 x 2 x 2 factorial with:

2 levels of cognitive complexity A_1 complex and A_2 simple

2 levels of set structure, B_1 ordered and B_2 random, and

2 levels of color codability D_1 a high, represented by well named colors and D_2 or low, represented by poorly named colors.

Analysis of variance of the color problem (Table 8) lent some support to the sensitivity (minor) hypothesis. As predicted, mean consistency scores (Table 9) were significantly higher for complex Ss than for simple Ss in: low codability color sets ($p<0.10$) in randomly ordered sets ($p<0.025$) and low codability randomly ordered sets ($p<0.10$). T-tests were used (Table 10). Contrary to hypothesis minor 4, cognitively simple Ss' mean consistency scores are higher but not different statistically, for sets with random structure than for sets with ordered structure.

Figure 4

Representation of the cognitive complexity x problem complexity interaction from data appearing in Table 7.

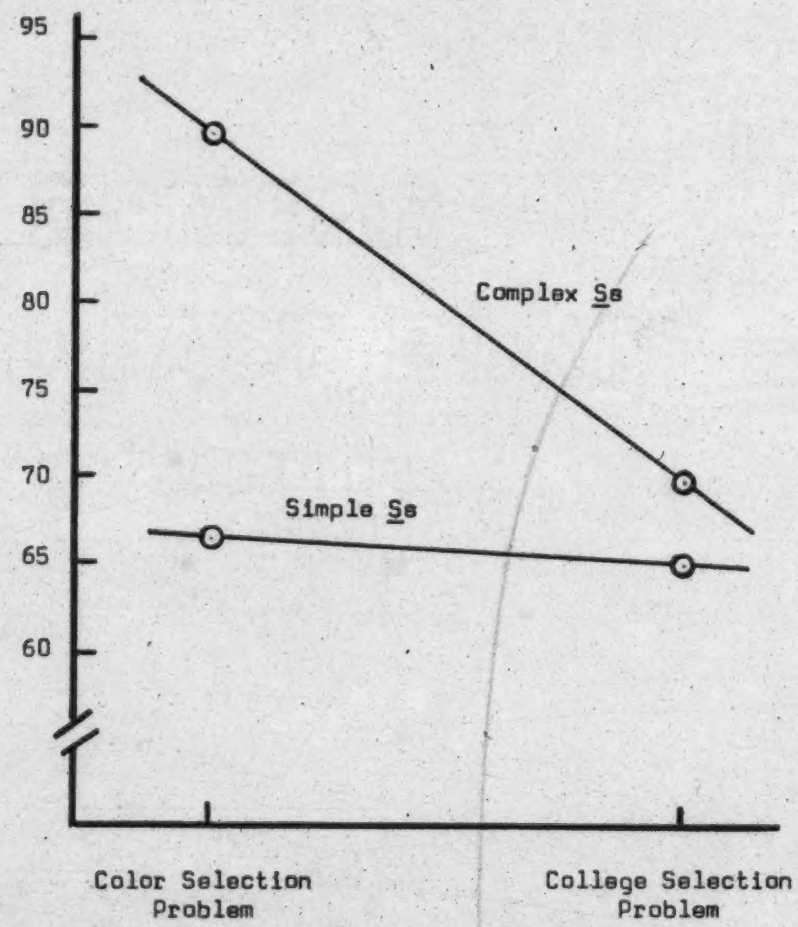


Table 7

Data for the cognitive complexity x problem complexity interaction. Entries are mean consistency coefficients x 100.

	C_1 Color Selection Problem	C_2 College Selection Problem
A_1 Complex Ss	89.428	69.893
A_2 Simple Ss	66.643	64.071

Difference between Mean Consistency Scores for Complex (A_1) and Simple (A_2) Ss under Color Selection Problem (C_1) and College Selection Problem (C_2)

C_1:	A_1-A_2	89.428 - 69.893	19.535
C_2:	A_1-A_2	66.643 64.071	2.572

Table 8

Summary of analysis of variance for color selection problem.

Measures are consistency scores for preference sets.

A Cognitive complexity, D codability, C set structure

Source of Variation	DF	MS	F	P
A	1	5343.02	10.04	<0.01
D	1	9.45	0.01	
AxD	1	546.87	1.03	
C	1	407.16	0.76	
AxC	1	42.88	0.08	
DxC	1	279.02	0.524	
AxBxC	1	13.02	0.024	
Error	48	531.98		

Table 9

Mean consistency coefficients x 100 for cognitively complex and cognitively simple Ss in the color selection problem.

	Random Structure		Ordered Structure	
	High Codability	Low Codability	High Codability	Low Codability
Cognitively Complex Ss	93.00	93.00	91.28	80.43
Cognitively Simple Ss	66.43	77.00	66.42	69.86

Table 10

T-test for minor hypotheses

Hypothesis	t	df	
1	1.68	13	<0.1
2	2.37	13	<0.025
3	1.50	6	<0.1
4	1.07	13	n.s.

Table 11

Summary of analysis of variance for college selection problem.

Measures are consistency scores for preference sets.

A cognitive complexity, B set structure

Source of Variation	DF	MS	F
A	1	92.57	0.252
B	1	412.57	1.125
AxB	1	126.00	0.344
ERROR	52	366.73	

The college selection problem was also contained within the overall design as a 2 x 2 factorial (The codability dimension is not relevant) with:

2 levels of S complexity A_1 complex and A_2 simple and

2 levels of set structure B_1 ordered and B_2 random.

A separate analysis of variance (Table 11) was performed on the college selection data. Mean consistency coefficients were higher for complex than simple Ss in randomly structured sets as predicted. Again, contrary to hypothesis, mean consistency coefficients were higher, but not statistically different, in randomly structured than in orderly structured sets for simple Ss. Mean consistency coefficients appear in table 12.

Performance Decrement

Extended responding in the college selection problem necessitated by the larger set of ten elements as compared to six in the color selection problem may have produced a decrease in consistency coefficients. This possibility was investigated. Sequencing of pairs in ordered sets allows for an indefinitely expanding set. Responses for an ordered set of four stimuli are simply the responses for the minimal subset of three stimuli plus the responses for each of the three stimuli of the minimal set combined with the fourth. In this way, every S provides data for sets of three to n stimulus elements, where n is the maximum number of elements in the stimulus set.

A six element ordered subset was extracted from and compared to the full ten element ordered set college selection problem result. The analysis of variance summarized in Table 13 revealed no significant

Table 12

Mean consistency coefficients x 100 for cognitively complex and cognitively simple Ss in the college selection problem.

	Random Set Structure	Ordered Set Structure
Cognitively Complex Ss	70.857	62.429
Cognitively Simple Ss	65.286	62.857

Table 13

Summary of analysis of variance for effects of performance decrement due to extended responding. Measures are consistency scores of paired comparison preferences given by Ss to ordered sets of 6 and 10 stimulus elements in the college selection task.

A cognitive complexity, B number of stimulus elements (six or ten) per set

Source of Variation	DF	MS	F
Between Ss			
A:	1	121.86	0.134
Error:	32	911.98	
Within Ss			
B:	1	127.30	0.544
AxB:	1	174.58	0.747
Error:	32	233.83	

difference between the six element subset and the ten element set: lower scores may not be present in sets with more elements. The above result also implies that differences in the college selection and color selection problems are not attributable to the pressure of increased number of stimulus elements in the college selection problem. It cannot be held that the greater demands involved in making more preferences among more stimulus elements within the college selection problem produced real differences in consistency scores.

Discussion

The main purpose of the study was to investigate the relationship between cognitive complexity and consistency (transitivity) of preference. To this end, consistency of responses in cognitively simple and cognitively complex Ss in two selection tasks of differing complexity was researched. The following predictions were tested. Cognitively complex Ss have generally higher consitency scores than cognitively simple Ss and there is an interaction between cognitive complexity and problem complexity. Consistency scores are lower for both cognitively complex and cognitively simple Ss in the more complex college selection problem.

The main predictions were clearly supported. Cognitively complex Ss showed higher consistency scores than cognitively simple Ss in the more simple color selection problem, but essentially equivalent consistency scores in the more complex college selection problem. Thus the relationship between cognitive complexity and consistency appears to be dependent on problem complexity.

While the form of the interaction between cognitive complexity and problem complexity was not stipulated since the position of the two selection problems on the complexity continuum could not be readily assessed, results indicated that the color selection problem is near the "optimal" complexity level while the college selection problem is at the "superoptimal" complexity level. The interaction found above suggests that some modification of the inverted U-curve hypothesis of Schroder et. al. (1967) may be required to accommodate accurate description of relationships among levels of integrative

complexity, levels of environmental complexity and consistency of preference structures.

Since our data (curves) are based upon two points, any confirmation of the inverted U-curve hypothesis is certain to be limited. However, the findings are interpretable by alternate relationships presented in graphical form in Figure 5. Corroborative evidence from Bradbury's (1970) experiments suggests the interpretations given in Figure 5 may be more accurate. Bradbury varied stimulus complexity by increasing the number of stimulus elements in a stimulus set from four to seven and presented sequences of paired comparisons to a random sample of adult subjects. Graphical data, presented by Bradbury essentially describes a monotonically decreasing function (similar to those of Figure 5) in which preference consistency is maximal at simplest task levels and then drops consistently as complexity increases. Further research at various complexity levels within a given problem and with problems of varying complexity seems required to map the functional relationship between consistency and problem complexity. However, the present limited information of this study and Bradbury's work (1970) suggests that an inverted half U-curve rather than an inverted U-curve may be a more valid representation of the functional relationship between environmental complexity and preference consistency. Similarly, a family of inverted half U-curves would be required to incorporate the integrative complexity variable into the model.

Findings stated above, have implication for the generality of the integrative complexity construct. Results clearly indicated that level of integrative complexity is involved in determining the

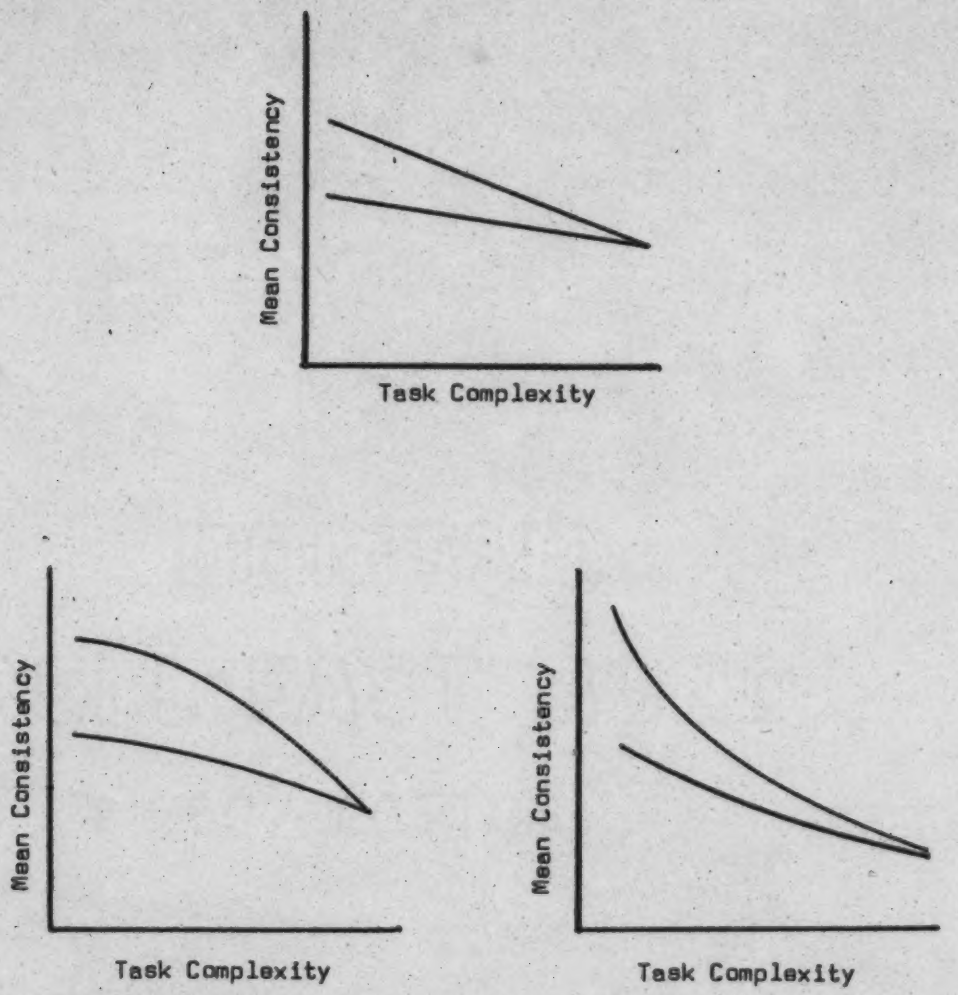


Figure 5

Three functional relationships consistent with the information on the interaction between cognitive complexity and selection task complexity in determining consistency of response. In each case, upper curve is for complex Ss, and lower curve is for simple Ss. These are alternatives to the inverted - U curve.

consistency with which a set of preferences is generated in choice situations of approximately optimal complexity. Importantly the preferences were structured in a cognitive-perceptual task involving choice among non-social stimuli. Thus it appears that the construct validity of integrative complexity extends beyond the social-interpersonal domain to other realms, particularly that of subjective preference for non-social stimuli.

Data from test of the secondary hypotheses were difficult to interpret. Harvey et, al, (1961) and Schroder et, al, (1967) hypothesized that for persons low in integrative complexity, behavior is maximally controlled by external stimulus conditions. Sensitivity predictions were formulated in regard to this claim. Consequently, ordered structure and high codability were expected to enhance consistency of cognitive function for simple Ss, while random structure and low codability were expected to hinder functioning. Complex Ss were expected to be relatively insensitive to such factors of the stimulus situation. Examination of the table of means for the color analysis (Table 10) showed that for simple Ss the pattern of means obtained was almost the inverse of that predicted. Also unexpectedly, the predicted pattern of means for simple Ss appeared to be matched to the pattern obtained by complex Ss

The above results are more comprehensible when analyzed with reference to the discrimination aspect of integrative complexity. Discrimination for Schroder et, al, refers to the fineness of organization among stimuli that are ordered along a given dimension and reflects the capacity of a dimension to distinguish stimuli. The dimensions employed

by complex Ss are assumed to have organizing schema that permit identification of a wide range and variety of stimulus characteristics. The basic proposition is that abstract schema enable greater use of information. Thus the somewhat subtle external cues, contained in codability of color (degree of embededness in language) and degree of structure in order of presentation of stimulus pairs, were likely detected by complex but not by simple Ss.

The above implications and conclusions concerning "cue-effects" are offered quite tentatively. More adequate research of "cue-effects" as used in this study, is required before definitive statements concerning their importance can be made.

In regard to the investigation of a possible performance decrement, comparison of the six element ordered set and ten element ordered set in the college selection problem revealed no significant difference, thus it is unlikely that difference between the college selection problem and color selection problem stem from the increased number of elements being compared. Instead, the difference is likely attributable to increased amount of information processed per unit time and the amount of integration of information required in responding (appropriately) to the task.

Information obtained in this study can be informatively related to dissonance theories of social change. Both strong reluctance to attribute inconsistency in preference to oneself (Tversky, 1969) and dismay at revealed inconsistency (Rokeach, 1971) have been documented. This suggests that people may rely largely upon subjective determinants in selection and hierarchical organization of preferences and values.

If value-attitude structure is akin to subjective color preference in that it is largely subjectively determined, then it might be expected from the results of this study that simple Ss may show greater inconsistency in the structuring of the value system. This possibility coupled with the simple Ss' greater need for consistency (Ware and Harvey, 1967; Leventhal and Singer, 1964; Mayo and Crockett, 1964) and their tendency to use directionally consistent changes in dissonance reduction (Schroder and Crano, 1965) suggests that the simple S may show greater susceptibility to dissonance induced attitude-value change.

Given that simple Ss compared to complex Ss show greater need for consistency and generate more inconsistency of which they are unaware, it follows that subsequent exposure of this greater amount of inconsistency on the part of the simple Ss, should be more effective in motivating change. This rationale assumes that dissonance induction and reduction are porportional to the degree of perceived inconsistency.

Summary

Intransitivity is related to cognitive structure. Situational factors subsumed under environmental complexity are important mediators of level of cognitive functioning and thereby important determinants of transitivity of preferences.

There is a tendency for integratively simple Ss to generate more inconsistency in subjectively structured preference sets. The implication is that the predictive power of dissonance theory may be greatest for simple Ss in situations manifesting obvious inconsistencies.

Consistency of preference is also related to codability of language. This has been demonstrated experimentally. Bradbury (1970) found that sentences, named colors, unnamed colors, and musical chords stimuli yield decreasing transitivity in that order. Rationality as measured by transitivity thus appears to decrease as the ability to verbally codify a stimulus decreases.

Another external factor, set structure, seems to affect transitivity (Bradbury, 1970) too. If stimulus elements are found in a predictable sequential pattern, transitivity will be higher than if the occurrence of stimulus elements is randomly determined.

Results in the present study for the structure variable are in the opposite direction to that predicted and obtained by Bradbury (1970). However, differences were not statistically significant. Bradbury's (1970) findings regarding codability and structure variables and the findings concerning codability in this study indicate that transitivity in cognitive processing can be viewed in some respects

as an adaptation to the logical structure present in external reality and in symbolic representation of reality.

In the current study, it was found that complex Ss yield more transitive preference sets than simple Ss for color stimuli of low codability. Thus stimuli less well anchored in an external logically structured system like language (or mathematics) will be more consistently processed by complex Ss. High codability color stimuli are also processed more consistently by complex Ss and random presentation of stimuli seems to be less disruptive of cognitive function for complex than for simple Ss.

Indications are that complex Ss are better able to employ external aid to their advantage, in building internal consistency of response. Findings are indicative of the greater adaptability and flexibility of the complex S who can function more transitively than the simple S with or without external aid.

It may be concluded that the complex S is both inherently more transitive and more skillful at exploitation of external cues (logical structure present in external reality) for enhancing his cognitive functioning when operating in situations where preferences are essentially internally determined.

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INDIVIDUAL - TOPICAL INVENTORY

(Form A)

INSTRUCTIONS

You will be given some situations and topics to which we would like you to respond. The responses are given in pairs. You are to choose one response from each pair. Choose the response that most closely fits your opinion or feeling and indicate your choice by blacking "A" or "B" corresponding to the response chosen. Always choose one member of each pair. Never choose both members of the pair and do not skip over any of the pairs. If you agree with both, choose the one you agree with most strongly. If you do not agree with either, choose the one you find the least disagreeable of the two.

Example:

Here is an example of the way the questions will be asked and the way they should be answered. The manner in which you will indicate your choice between the two given responses is illustrated below:

When I am confused ...

Pair No. (i)	
A	B
I try to find a solution and end the confusion.	I completely ignore the fact I am confused.

(ii)

A	B
I break out into a nervous sweat.	I remain calm at all times.

How to respond:

First: Decide which response you agree with most.

Second: Indicate the response you agree with most by blacking in the identifying letter on the IBM sheet. Thus, if in comparing the first pair of statements, you agree with the statement, "I try to find a solution and end the confusion," more than with the statement "I completely ignore the fact that I am confused," you would black in the letter "A" (above the chosen statement). Having chosen one (never both, never neither) statement from the first pair of statements, you would then move on to the second pair. If, in considering the second pair, you find that you agree more with the statement, "I remain calm at all times," (as compared to the statement, "I break out into a nervous sweat") you would black in the letter "B" on the IBM sheet.

On the pages that follow there are 36 different pairs of responses. There are six pairs on a page. You are to select one response from each pair, the one that more accurately shows your opinion or feeling and record your choice by blacking in the letter indicating the statement chosen. Be frank and indicate, in each case, your true feeling or opinion or the reaction which you actually would make in the situation. Do not indicate how you

should feel or act, rather, indicate how you do feel and act.

Make sure that you are aware of the situation or topic that each pair of responses refers to. You will find the situation or topic identified at the top of each page. All items on the page refer to the situation or topic appearing at the top of that page.

When you are finished, your paper should contain 36 marks. Check back and make sure that you have made 36 choices, no more no less.

Remember: (1) Respond only once for each pair; that is, choose one member of the pair, never both, never neither. Indicate your choice by blacking in either "A" or "B".

(2) When you are finished you should have made 36 marks.

Work at your own rate of speed but work straight through the inventory without stopping. Once you have completed a page do not return to it.

Example item from ITT

1. Imagine that someone has criticized you. Choose the response from each pair that come closest to your feelings about such criticism. Indicate your choice by blacking in either "A" or "B" on the IBM sheet.

When I am criticized...

Pair No.	A	B
(1)	I try to take the criticism, think about it, and value it for what it is worth. Unjustified criticism is as helpful as justified criticism in discovering what other people's standards are.	I try to accept the criticism but often find that it is not justified. People are too quick to criticize something because it doesn't fit their standards.
(2)	I try to determine whether I was right or wrong. I examine my behavior to see if it was abnormal. Criticism usually indicates that I have acted badly and tends to make me aware of my own bad points.	It could possible be that there is some misunderstanding about something I did or said. After we both explain our viewpoints, we can probably reach some sort of compromise.
(3)	I listen to what the person says and try to accept it. At any rate, I will compare it to my own way of thinking and try to understand what it means.	I feel that either I'm not right, or the person who is criticizing me is not right. I have a talk with that person to see what's right or wrong.
(4)	I usually do not take it with good humor. Although, at times, constructive criticism is very good, I don't always think that the criticizer knows what he is talking about.	At first I feel that it is unfair and that I know what I am doing, but later I realize that the person criticizing me was right and I am thankful for his advice. I realize that he is just trying to better my actions.
(5)	I try to ask myself what advantages this viewpoint has over mine. Sometimes both views have their advantages and it is better to combine them. Criticism usually helps me to learn better ways of dealing with others.	I am very thankful. Often I can't see my own errors because I am too engrossed in my work at the time. An outsider can judge and help me correct the errors. Criticism in everyday life usually hurts my feelings, but I know it is for my own good.

(6)

A	B
It often has little or no effect on me. I don't mind constructive criticism too much, but I dislike destructive criticism. Destructive criticism should be ignored.	I try to accept and consider the criticism. Sometimes it has caused me to change myself; at other times I have felt that the criticism didn't really make much sense.

Norms for the ITI

System

Decile	1	2	3	4
10	11	13	13	15
9	10	12	12	14
8	9	11	12	14
7	8	10	11	12
6	8	9	10	12

System scoring. If a S scores 9th or 10th decile in one system and 8th or lower in all others, classify him in his highest system. Ss who score 8th Decile in one system and 6th or lower in all others may also be classified in their highest scoring system.